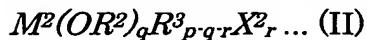


## CLAIMS

1. A gas barrier layered product comprising a base material and a layer stacked on at least one surface of the base material,
  - 5 wherein the layer is formed of a composition that includes: a hydrolyzed and condensed product of at least one compound (L) containing a metal atom to which at least one characteristic group selected from a halogen atom and an alkoxy group has been bonded; and a neutralized product of a polymer containing at least one functional group selected from a carboxyl group and a carboxylic anhydride group, and
  - 10 at least a part of -COO- group contained in the at least one functional group has been neutralized with a metal ion having a valence of two or more.
- 15 2. The gas barrier layered product according to claim 1, wherein at least 10 mol% of the -COO- group contained in the at least one functional group has been neutralized with the metal ion.
- 20 3. The gas barrier layered product according to claim 1, wherein 0.1 to 10 mol% of the -COO- group contained in the at least one functional group has been neutralized with a univalent ion.
- 25 4. The gas barrier layered product according to claim 1, wherein the compound (L) includes at least one compound (A) that is expressed by the following chemical formula (I):  
$$M^l(OR^l)_nX^l_kZ^l_{m-n-k} \dots \text{ (I)}$$
where  $M^l$  denotes Si, Al, Ti, Zr, Cu, Ca, Sr, Ba, Zn, B, Ga, Y, Ge, Pb, P, Sb, V, Ta, W, La, or Nd;  $R^l$  indicates an alkyl group;  $X^l$  indicates a halogen atom;  $Z^l$  denotes an alkyl group substituted by a functional group having reactivity to a carboxyl group;  $m$  is equal to a valence of  $M^l$ ;  $n$  denotes an integer of 0 to  $(m-1)$ ;  $k$  indicates an integer of 0 to  $(m-1)$ ; and  $1 \leq n + k \leq (m-1)$ .
- 30 5. The gas barrier layered product according to claim 4, wherein in the chemical formula (I), the functional group having reactivity to a carboxyl group is at least one selected from the group consisting of an epoxy group, an amino group, and an isocyanate group.

6. The gas barrier layered product according to claim 4, wherein the compound (L) is composed of the compound (A) and at least one compound (B) expressed by the following chemical formula (II):



5 where  $M^2$  denotes Si, Al, Ti, Zr, Cu, Ca, Sr, Ba, Zn, B, Ga, Y, Ge, Pb, P, Sb, V, Ta, W, La, or Nd;  $R^2$  indicates an alkyl group;  $R^3$  denotes an alkyl group, an aralkyl group, an aryl group, or an alkenyl group;  $X^2$  indicates a halogen atom;  $p$  is equal to a valence of  $M^2$ ;  $q$  denotes an integer of 0 to  $p$ ;  $r$  indicates an integer of 0 to  $p$ ; and  $1 \leq q + r \leq p$ , and

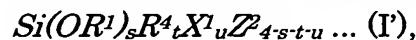
10 a mole ratio of the compound (A) / the compound (B) is in a range of 0.5 / 99.5 to 40 / 60.

7. The gas barrier layered product according to claim 1, wherein an organic group having at least one characteristic group selected from the

15 group consisting of a halogen atom, a mercapto group, and a hydroxyl group further has been bonded to the metal atom of the compound (L).

8. The gas barrier layered product according to claim 7, wherein the metal atom is a silicon atom.

20 9. The gas barrier layered product according to claim 7, wherein the compound (L) includes at least one compound (A') that is expressed by the following chemical formula (I'):



25 where  $R^1$  and  $R^4$  each denote an alkyl group independently;  $X^1$  indicates a halogen atom;  $Z^2$  denotes an organic group having at least one characteristic group selected from the group consisting of a halogen atom, a mercapto group, and a hydroxyl group;  $s$  indicates an integer of 0 to 3;  $t$  denotes an integer of 0 to 2;  $u$  indicates an integer of 0 to 3;  $1 \leq s + u \leq 3$ ; and  $1 \leq s + t + u \leq 3$ .

30 10. The gas barrier layered product according to claim 7, wherein the compound (L) contains at least one compound selected from the group consisting of chloromethyltrialkoxysilane, chloromethyltrichlorosilane, 2-chloroethyltrialkoxysilane, 2-chloroethyltrichlorosilane, 3-chloropropyltrialkoxysilane, 3-chloropropyltrichlorosilane, mercaptomethyltrialkoxysilane, mercaptomethyltrichlorosilane, 2-mercaptopethyltrialkoxysilane, 2-mercaptopethyltrichlorosilane,

3-mercaptopropyltrialkoxysilane, 3-mercaptopropyltrichlorosilane, N-(3-trialkoxysilylpropyl)gluconamide, and N-(3-trialkoxysilylpropyl)-4-hydroxybutylamide.

5 11. The gas barrier layered product according to claim 7, wherein the gas barrier layered product has an oxygen transmission rate of 1.0 cm<sup>3</sup>/m<sup>2</sup>·day·atm or lower in an atmosphere of 20°C and 85% RH.

10 12. The gas barrier layered product according to claim 7, wherein the gas barrier layered product has a haze value of 3% or lower.

15 13. The gas barrier layered product according to claim 9, wherein the compound (L) further comprises at least one compound (B) that is expressed by the following chemical formula (II):

$M^2(OR^2)_qR^3_{p-q-r}X^2_r \dots \text{(II)}$ ,  
where  $M^2$  denotes Si, Al, Ti, Zr, Cu, Ca, Sr, Ba, Zn, B, Ga, Y, Ge, Pb, P, Sb, V, Ta, W, La, or Nd;  $R^2$  indicates an alkyl group;  $R^3$  indicates an alkyl group, an aralkyl group, an aryl group, or an alkenyl group;  $X^2$  denotes a halogen atom;  $p$  is equal to a valence of  $M^2$ ;  $q$  denotes an integer of 0 to  $p$ ;  $r$  indicates an integer of 0 to  $p$ ; and  $1 \leq q + r \leq p$ .

20 14. The gas barrier layered product according to claim 13, wherein a mole ratio of the compound (A') / the compound (B) is 0.1 / 99.9 to 40 / 60.

25 15. The gas barrier layered product according to claim 1, wherein the content of an inorganic component contained in the composition is 5 to 50 wt%.

30 16. The gas barrier layered product according to claim 1, wherein the polymer is at least one polymer selected from polyacrylic acid and polymethacrylic acid.

35 17. The gas barrier layered product according to claim 1, wherein the metal ion is at least one selected from the group consisting of a calcium ion, a magnesium ion, a barium ion, and a zinc ion.

18. The gas barrier layered product according to claim 1, wherein the

composition further comprises polyalcohols.

19. The gas barrier layered product according to claim 18, wherein a weight ratio of the neutralized product / the polyalcohols is 10 / 90 to 99.5 /

5 0.5.

20. The gas barrier layered product according to claim 1, further comprising an adhesive layer disposed between the base material and the layer.

10

21. The gas barrier layered product according to claim 1, wherein the base material comprises a paper layer.

22. A packaging medium comprising a gas barrier layered product

15 according to claim 1.

23. The packaging medium according to claim 22, wherein a base material included in the gas barrier layered product comprises a paper layer.

20 24. A method for producing a gas barrier layered product, comprising:

a first process of forming, on a base material, a layer made of a composition including: a hydrolyzed and condensed product of at least one compound (L) containing a metal atom to which at least one characteristic group selected from a halogen atom and an alkoxy group has been bonded; and a polymer containing at least one functional group selected from a carboxyl group and a carboxylic anhydride group; and

25 a second process of bringing the layer into contact with a solution containing a metal ion with a valence of two or more.

30 25. The production method according to claim 24, wherein an organic group having at least one characteristic group selected from the group consisting of a halogen atom, a mercapto group, and a hydroxyl group further has been bonded to the metal atom of the compound (L).

35 26. The production method according to claim 24, wherein at least 10 mol% of a -COO- group contained in the at least one functional group is neutralized with the metal ion with a valence of two or more in the second

process.

27. The production method according to claim 24, further comprising:  
a process of preparing a solution (S) including the polymer and at  
5 least one compound containing a metallic element selected from the group  
consisting of the compound (L), a partial hydrolysate of the compound (L), a  
total hydrolysate of the compound (L), a partial hydrolyzed and condensed  
product of the compound (L), and a product obtained through condensation of  
a part of a total hydrolysate of the compound (L); and  
10 a process of forming the layer by applying the solution (S) to the base  
material and then drying it.
28. The production method according to claim 24, wherein the first  
process comprising:  
15 a process of forming the hydrolyzed and condensed product;  
a process of preparing a solution (S) including the hydrolyzed and  
condensed product and the polymer; and  
a process of forming the layer by applying the solution (S) to the base  
material and then drying it.
- 20 29. The production method according to claim 24, wherein in the polymer  
contained in the solution (S), 0.1 to 10 mol% of a  $-COO-$  group contained in  
the at least one functional group has been neutralized with a univalent ion.
- 25 30. The production method according to claim 24, further comprising a  
process of heat-treating the layer at a temperature of 120 to 240°C, after the  
first process and before and/or after the second process.